TRANSFORMATION RULES

We learn a lot about transformations when we analyze their motions in the coordinate plane. Patterns reveal shortcuts/rules that allow us to quickly determine the coordinates of an image.

REFLECTION ON THE COORDINATE GRID

Reflection over the y axis.

When we reflect over the y axis, the y values are unchanged and the x values are negated (opposite).

RULE FOR REFLECTION OVER THE Y AXIS \[ r_{y-axis} (x, y) \rightarrow (-x, y) \]

Reflection over the x axis.

When we reflect over the x axis, the x values are unchanged and the y values are negated (opposite).

RULE FOR REFLECTION OVER THE X AXIS \[ r_{x-axis} (x, y) \rightarrow (x, -y) \]
Reflection over the \( y = x \) line.

When we reflect over the \( y = x \) line, the \( x \) and \( y \) values are reversed.

**RULE FOR REFLECTION OVER THE Y = X LINE** 
\[ r_{y=x} (x, y) \rightarrow (y, x) \]

**ROTATION ON THE COORDINATE GRID**

**Rotation of 90° about the Origin**

When we rotate 90° about the origin, we see that the \( x \) and \( y \) coordinates are reversed and the new \( x \) coordinate is negated.

**RULE FOR ROTATION BY 90° ABOUT THE ORIGIN** 
\[ R_{O,90°}(x, y) = (-y, x) \]
**Rotation of 180° about the Origin**

When we rotate by 180° about the origin, we see the x and y coordinates are negated.

**RULE FOR ROTATION BY 180° ABOUT THE ORIGIN**

\[ R_{O,180°}(x, y) = (-x, -y) \]

**Rotation of 270° about the Origin**

This is also a rotation of -90°.

When we rotate by 270° about the origin, we see that the x and y coordinates are reversed and the new y coordinate is negated.

**RULE FOR ROTATION BY 270° ABOUT THE ORIGIN**

\[ R_{O,270°}(x, y) = (y, -x) \]